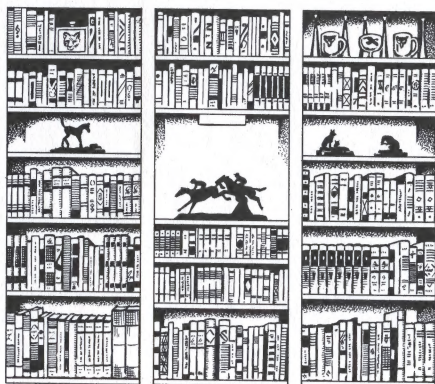


BIG AND LITTLE FISHES



RECOLLECTIONS
OF
FRANK GRAY GRISWOLD



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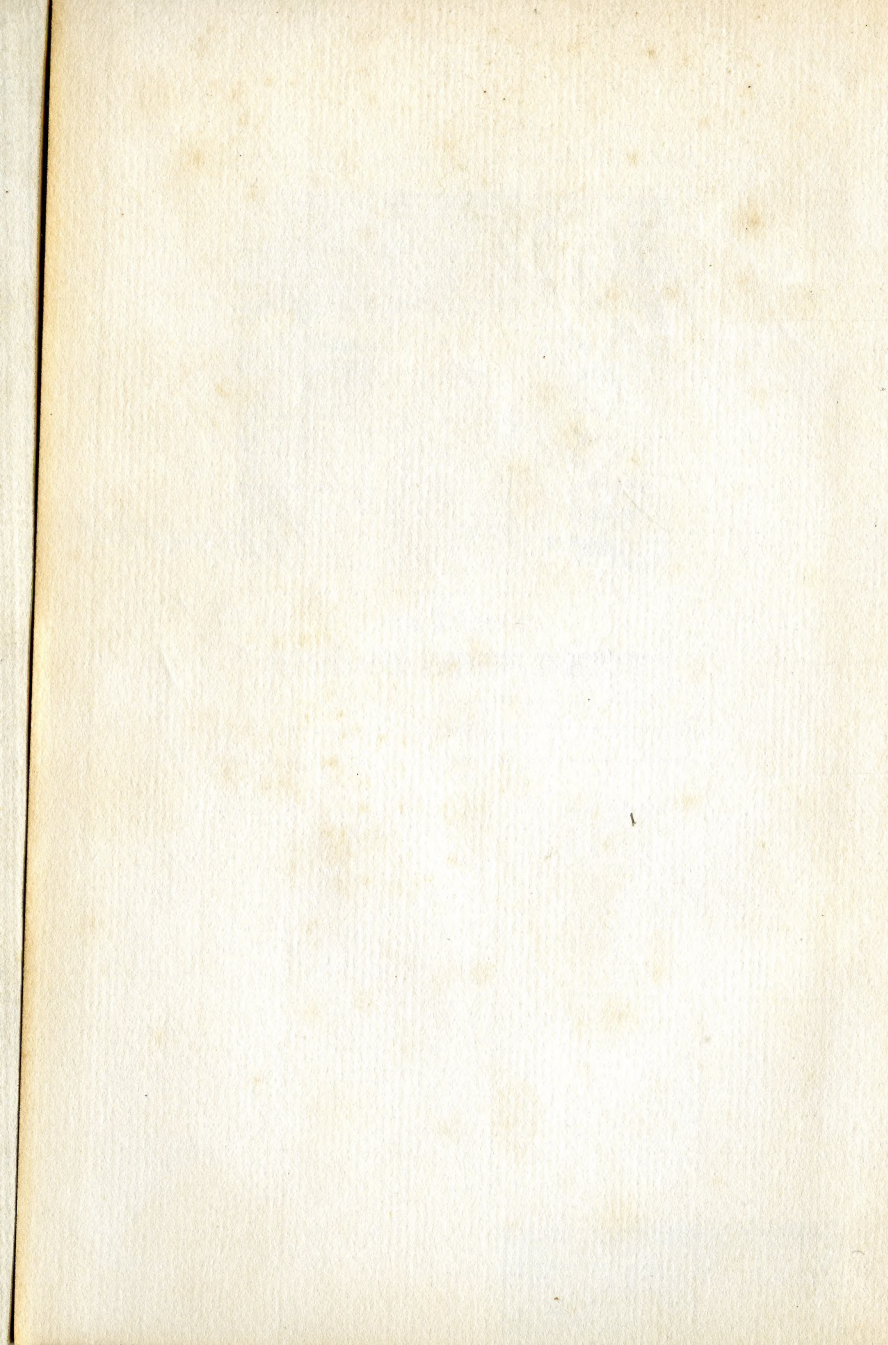
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J. R. Hughes

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BIG AND LITTLE FISHES



BUCKTAIL DRY FLY

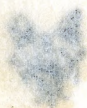
Actual size

32 pound Salmon

BIG AND LITTLE FISHES

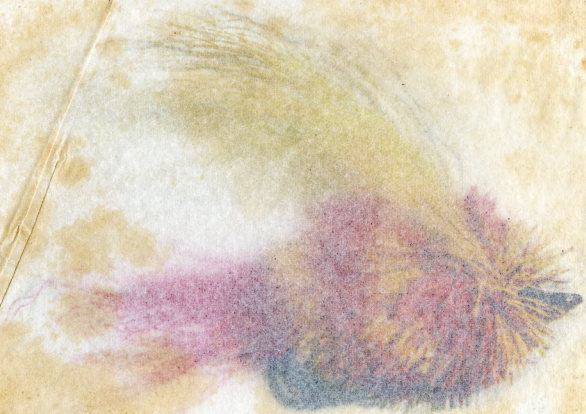
BY

F. GRAY GRISWOLD



RECENTLY PRINTED

1927



BIRCHTAIL DRY FLY

Adonis vernalis

32 pound Salmon

BIG AND LITTLE FISHES

BY

F. GRAY GRISWOLD



PRIVATELY PRINTED

1927

THE PLIMPTON PRESS

NORWOOD

MASS

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ANGLING

Angling is essentially the sport of old age for it needs much patience and patience only comes with age.

The self-control that comes with time is unknown to youth.

Youth expects quick results, old age is satisfied if things are well done, so the delicate touch in sport appeals to us more and more as we grow in years.

Youth demands competition in sport, and more activity than angling affords.

Although time may impair the agility of an angler it never seems to interfere with his keenness.

FOREWORD

THIS little book is issued for the sole purpose of enabling anglers to become acquainted with the results of the reading of the scales of the Atlantic Salmon (*Salmo salar*).

Mr. W. L. Calderwood, F.R.S.E., Inspector of Salmon Fisheries of Scotland, has had the kindness to investigate and study a quantity of sets of scales from the Moisie and Grand Cascapedia rivers of Eastern Canada, with most interesting results, doubly so because, although Professor Gilbert and others have studied the scales of our Pacific salmon, its cousin the Atlantic salmon, the fish we angle for, has never before been scientifically investigated.

Acknowledgment is made to Mr. Calderwood for his kindness and the great interest he has taken in this worthy and enlightening subject.

F. G. G.

FISHERMAN'S LUCK

FISHERMAN'S LUCK

IS there such a thing as luck? Some people think not, but if it is a myth how does it happen that some men always seem to hold good cards and other men always back winners? The first case is surely good luck, the second is more often a good knowledge of breeding and a study of racing form.

I have always had good luck fishing, yet fishing luck is chiefly forethought, a study of wind and weather, and a careful selection and inspection of tackle, as well as much industry and determination. If an angler does not keep his line wet he cannot take fish.

Luck in salmon fishing consists chiefly in the river one is fortunate enough to fish in. As for that, I am lucky indeed for I have fished the Grand Cascapedia¹ in Eastern Canada for years. It is a beautiful rapid

¹ Club Waters.

stream with forty-two miles of the best of fishing and over 50 pools. The water is usually high in June owing to the melting snow on the hills, and the river contains many and large fish, for the Grand Cascapedia holds the record for the heaviest average weight of salmon of all the rivers of the world, namely 23 pounds.

I have studied fish and their whims and fancies, and am always trying to take them by methods that are contrary to "the book."

Most anglers are content to fish in the good old way as laid down by the professors of the past and are satisfied when they take fish to throw them up on the bank without any further thought. I examine and study mine, for there is always something to learn.

What amuses me most is to fool fish and then oblige them to give me as much personal pleasure as possible.

I do most things that the books tell one not to do, yet take as many fish as most orthodox anglers. Perhaps it is my good luck that stands by me?

It may amuse anglers to know my method of fishing for salmon:

I never change hands when casting and hold my line with the second finger of my right hand. I usually fish with a 13 foot stiff Leonard split-bamboo rod. This rod is intended for casting against a strong upstream wind, has very little bend to it, and carries a medium sized casting line.

I use a multiplying reel, without any set drag when playing a fish, and control the line with my left thumb on the cork handle above the reel. In this manner, through a soft thumbstall, I graduate the pressure on the fish, which cannot otherwise be done without often changing the reel-brake. My multiplier prevents any possible slack line.

As my rod bends but slightly I get all the pleasure a fighting fish can give me through my hands and arms, instead of hugging a bending and dipping rod which is enjoying all the fun and is killing the fish. My method is done with a light hand, the orthodox method is mechanical.

When a fish jumps I raise my rod to clear the line from the fish. The book says you must lower your rod at such moments, but why present a fish with slack line? The salmon is back in the stream before it reaches him.

The balance of a fish when in the air is most insecure. On more than one occasion I have turned a 200 pound jumping marlin over. To do this you must wait until the fish is at the peak of its jump. A slight setback to the rod will then throw the marlin completely off its balance without any great strain to your line.

I usually use my own fly. In five seasons I have taken 396 salmon that weighed 8,868 pounds. Two hundred and eighty-five of this number were taken on the "Griswold Gray." That does not mean that it is a better fly than a Dusty Miller or a Black Dose, but it means that I like it better.

I took two salmon last season on "June Bugs," bright yellow bucktail flies as large as a half dollar and containing no feathers. These flies were cast down-stream and did

not sink, but floated on the surface. One fish weighed 25 pounds and was taken in rapid water, but the other, a 32 pounder, was taken out of a glassy pool. These two fishes had scorned several regulation flies of different sizes, but took the "June Bugs" with gusto. This shows we know but little concerning flies, or was it luck? One fish might have been, but certainly not two.

As we limit ourselves to 8 salmon a day on the Grand Cascapedia no great bags are made. My luckiest day was 8 salmon; 32, 33, 32, 31, 28, 26, 22, 21 = 227 pounds, and 22 large mended kelt (June 19, 1925). The kelt afforded great sport and were netted and returned to the river with care.

The best fighting salmon that I took last season, and the highest jumper that I ever saw, was a mended kelt 45 inches long. They are sometimes very fit just before they go to sea. Fresh run salmon have very soft and pliant fins, which is one reason why they tire quickly. Fresh water hardens the fins and they become more like whalebone, so that a

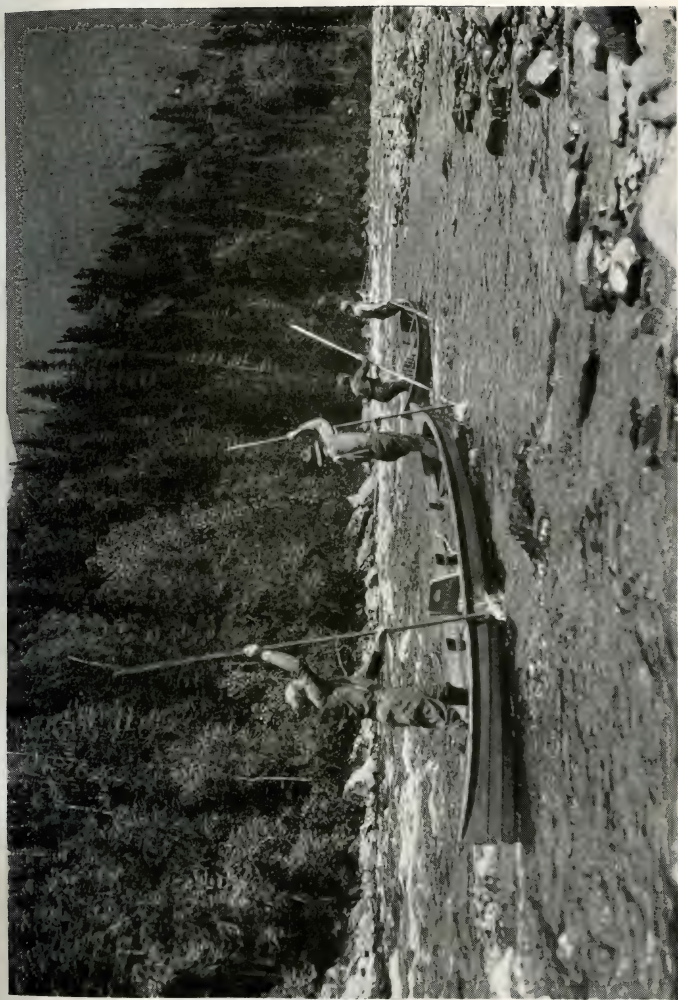
healthy mended kelt often has great agility. They however differ greatly; some are very weak subjects.

My fishing diary tells me that I have hooked, played, and liberated over 500 large tarpon in a score of years. This would imply great luck, but it really means thousands of miles of travel both by land and sea. It also means that I have often been among them for weeks at a time without a semblance of a strike.

The temperature of the water has so much to do with their desire to feed, that it is impossible to take them if the water is not just right. I have studied the tarpon for years and find them most beautiful, interesting, and game fish.

Before the World War it was my custom to visit Cuban waters yearly during the month of February for the purpose of tarpon fishing.

Having angled for this interesting fish in the rivers and bayous of Florida for some



ROUGH WATER



years, and having been sadly afflicted by mosquitoes and sandflies, I thought it wise to go farther afield and ascertain if it were not possible to find good sport under more comfortable conditions.

A friendly Cuban who had been marooned in Florida during the Spanish War had told me of a little river in Cuba, near his natal village, where tarpon were plentiful. He had also told me that I must take everything with me if I proposed to fish, for his countrymen fished with nets only and knew nothing about fishing for sport.

The first thing I did was to have a 50 foot fishing yacht designed and built. She drew but four feet, carried four men, and was as comfortable as a house and much more convenient, for she could be moved about from place to place by sail or motor power. She carried two small launches for fishing. With this vessel, and another which I built ten years later, I visited almost every river in Cuba, hunting for tarpon.

I found them in those rivers that ran clear; the muddy streams are shunned by that clean, aristocratic fish, the "Silver King."

The method of fishing that I employed was trolling sixty feet of wet line from a launch, travelling at four miles an hour.

The result of river fishing does not mean a large bag. It is quick work, for you must not give the fish any slack, a difficult thing to avoid even when trolling up-stream as there is little tide and the current of the rivers is not strong. It is difficult to keep a taut line.

When once inside the bar the rivers are deep and the waters are often dyed brown by the cypress roots. The banks are lined with cabbage palms and deciduous trees which, in February, are just budding into leaf. Here and there a royal palm shoots up boldly with the grace and symmetry of a marble column. At sunset small white cranes and egrets fly up-stream to their roosts. They flit along close to the surface and the tarpon rise at their shadows as they fly by.

The tiny river my Cuban friend had told

me of was the Zaraguanacan. It empties into Nuevitas Bay and its upper waters flow through a mangrove swamp and are blocked by trees.

Mangrove trees grow along brackish water, and as their branches spread they drop suckers which attach themselves to the bottom when the water is shallow, eventually forming a green canopy of foliage over the whole surface of a shallow stream or swamp.

The navigable part of this deep but tiny stream was about one mile in length, and very narrow, and from each bank the mangrove boughs overhung the water.

On my first visit to the river I found a school of large tarpon rolling on the surface, as they often do in brackish water, and started fishing.

My bait was a small silver mullet. I had a strike at once and when reeling in had another strong pull. Then a large barracuda jumped at the end of my line. When I had landed the latter fish I discovered that a snapper had taken the mullet, and that the

barracuda had swallowed both snapper and mullet. That was a good beginning, three fish on the one hook at the same time.

A little farther up-stream I struck the school of tarpon and for an hour had my hands full. I hooked fish after fish, but could not save them for after a jump or two in mid-stream they would land high up among the branches of the mangroves and tumble back into the river, leaving my tackle entangled in the bushes.

On two flood tides I hooked and played 52 large tarpon and lost all but 6. These I turned loose after removing the hooks. It was the greatest day's fishing I ever had, also the greatest exhibition of acrobatics I ever witnessed. I lost almost all of my tackle trying to keep the big fish out of the woods.

I have taken six long journeys to California after marlin. One season there were no fish to be found, the other years I had good luck. That is to say, I have landed all told 22 marlin that averaged about 175 pounds in weight. I consider the marlin the greatest of

all sporting fish, but as a rule they are very difficult to find and when found difficult also to hook.

The marlin is a solitary fish, or at least so he appears to be off the Channel Islands of Southern California. One does see schools of four or six on the surface at times, but usually it is a single fish that shows.

During the month of September, 1916, I was marlin fishing at San Clemente Island and the fish were very scarce. We heard one day, however, that numbers had been seen about six miles from the island and I decided to look for them.

The sea was very rough, yet my boatman said he was willing to go off shore if I was, so what happened that day may be called determination instead of fisherman's luck, yet it had never happened to anyone before for the circumstances were not natural ones.

When we were about six miles from the island we found great patches of floating kelp and numbers of marlin feeding on sora.²

² Probably the Saurie (*Scomberesox saurus*).

Sora is the local name for a minnow-like fish. What the fish is I have never discovered, but am told it is neither a sardine nor is it an anchovy.

A kelp-cutter had been busy cutting the kelp around the shores of San Clemente for a nitrate factory that had recently been established at San Diego. Quantities of the loose weed had floated off shore accompanied by the small fry it had protected. This meant a feast for the marlin, for floating kelp is a poor lodging place for small fish. The marlin had collected from near and far for this unexpected picnic.

When marlin discover a school of sora in deep water they proceed to herd them as cowboys round up cattle. They drive them into so compact a mass that one can see from a distance the dark brown patch of fish on the surface of the sea. The marlin then charge through this compact body, striking to the right and left with their swords, and devour the small fish.

There seemed to be hundreds of marlin

about. The crest of every wave was pierced by large dorsal fins, and in the face of every big roller you could see these brilliantly colored large fish. It was the most wonderful fish picture that I ever saw.

The small fish they had been feeding on seemed simply to have whetted their appetites, for they pulled our teaser-poles overboard in their hurry to seize the flying fish, which it is the custom to troll astern for chum, and one fish grabbed my bait.

This fish jumped twenty-two times, stood on its tail, swam in large circles, charged close under the stern of the launch, and fought hard, but was finally hauled on board.

The second fish I hooked performed all manner of strange acrobatic feats and travelled for one hundred yards on the end of its tail, as needlefish often do. When it was finally alongside we found it was firmly hooked in the tail, which accounted for its strange gyrations.

I was given another flying-fish bait, and it

was not long before I hooked a third marlin. This was a tough customer that did not jump much; it fought more like a heavy shark and took a long time to subdue.

It was blowing hard and the sea was rising all the time. We had much trouble hauling the fish on board with block and tackle, and it would have been impossible for me to handle my rod and kill the three strong fish without a fixed rod-rest, for this helped me to steady myself in the rolling boat.

With 558 pounds of fish on board, the launch had all she could stagger under. My boatman wanted more fish, but I persuaded him that I had had enough exercise and that the boat had all she could carry.

I have seldom missed a striking marlin and my boatman insists that it is skill on my part, but I believe it has been simply fisherman's luck for, owing to the spike-like formation of their mouths, no amount of time or of line that you allow them will guarantee that the single-hook is in a position to be driven home when you strike the fish.

On our return to camp we found the other anglers had fished under the lee of the island all day and had seen no marlin.

They were impressed by my luck but I was surprised at their lack of determination. They had missed great fishing as well as a wonderful fish picture.

Fisherman's luck means a study of your quarry and a study of time and place. No two families of fishes fight alike, so that the procedure for their capture differs. It is the study of the idiosyncrasies of the special fish which you seek that must be considered, as well as the lures that should attract them.

In sea-fishing the tides must be considered as well as the habits of the fish, and in river fishing the height of the water, the color of the bottom, the wind, and the barometer. Salmon and trout feel the differences between a high and a low barometer and act accordingly.

The temperature of the water has to be considered as well. Tarpon do not show if the

water is below 68° , and salmon are listless if the water temperature is above 60° , in which case a dry fly only will interest them.

The tackle question has much to do with one's luck. The number of salmon that are lost on "last season flies" is great. We hate to part with our old flies and often fail to soak the new ones. We lose the one because either the gut loop pulls or the barb of the hook breaks, and the loop of the latter, being stiff, pries the cast knot open and the fly departs with the fish.

Therefore many little things prevent disaster. A few drops of glycerine in the water in which a cast is soaked may save many a fish, as an additional moment or two given to the proper tying of the fly to the cast will often prevent the loss of both salmon and fly. We all have these disasters which we call bad luck. They are really carelessness.

Most anglers, I find, are penny wise and pound foolish. I have known a fisherman to pole forty miles up a river in a canoe with only one complete angling outfit. His one

reel may go wrong or he may break his rod tip, and lose two or more days' fishing.

Good salmon fishing is expensive and most anglers pay the price without a murmur and economize on the paraphernalia that is necessary for their sport.

I believe we would take more fish if we started each season with everything quite new and of the best and most expensive quality. We should discard all lines, casts, and flies that have been used in former seasons and not trust them. It is more economical to throw a fly away than to lose it in a salmon.

I never count the fish I lose for I know it is usually my fault and I am ashamed of it. It always reminds me of the Frenchman at Blair Athol, who arrived late for dinner after stalking, and when asked if he had shot a stag proudly replied: "No, but I did wound three!"

BUCKTAIL FLIES

BUCKTAIL FLIES

NO one knows what it is that persuades a salmon to rise and take a fly. The popular flies certainly do not look like any living thing that swims in either fresh or salt water, yet the small bunch of feathers seems at times to be most attractive to *Salmo salar*.

It has been fully proved that late in the season, when the water is low and clear and its temperature above 60°, the fish are listless and disinclined to move, and that by casting a dry-fly upstream directly above them they may sometimes be persuaded to take.

It occurred to me that if a salmon would rise and take a hackle dry-fly in low and warm water there could be no reason why it should not do likewise in high and cold water.

The colorless hackle flies used in dry-fly fishing I knew would not answer, for in high water conditions they would hardly prove

attractive even if a fish could see them, also in heavy water it would be impossible to mark your fish and cast directly to it.

What I looked for was a large, brilliant, bucktail fly that would not sink and that could be fished in the usual manner downstream. I found the South Bend Bait Company of Indiana made large and small bucktail flies that were formed and dyed in most grotesque ways. These flies are intended to be attached to spinners for trolling purposes. I ordered a selection of these fuzzy-wuzzies and put them in my tackle box.

I was fishing a pool of rapid running water one day last season and rose a fine fish on a 5/0 fly. This salmon was evidently lying just above a rock where the flowing stream divided. I rested the fish and changed the fly to another and smaller pattern, and the salmon rose again leisurely. This happened several times until I was disheartened by the fish's casual indifference. Looking through my tackle box to see what fly I should try as a last resort, I saw the bucktails.



GEORGE MY GAFFER
and
"BUCKTAIL" SALMON

I selected and tied a large sized fly of this description to my cast.

The second time this fly, floating on the surface of the rough and rapid water, danced over the spot where the fish was lying, the salmon rose and took it with such keenness that the large hook was driven completely through its lower jaw.

My canoe men laughed with delight and I was greatly pleased when a 25 pound salmon was gaffed, yet believed that it was perhaps an accident and not likely to happen again.

One day a week later, when the river had fallen, I was fishing the upper waters in a pool with a glassy surface where the bottom could easily be seen. After dropping down and fishing without rising a fish we finally arrived at the last drop. Standing in the canoe I could clearly see three large salmon in the tail of the pool some distance apart. I noticed well where the largest of the three fish was quietly lying on a smooth rock and proceeded to fish for it. The salmon paid no

attention to the different flies I tried to tempt it with and seemed quite contented to remain where it was, gently fanning the water with its fins.

It is always most discouraging not to be able to move a fish that you can plainly see and I was about to give it up and leave the pool, when my gaffer said: "How about one of them funny flies?" This time I selected a red and yellow striped ball-like bunch of bucktail that hid a large sized hook. The first time this queer looking object floated over the salmon the fish rose with a strong flirt of its tail and seized the lure to our great satisfaction.

This salmon weighed fully 32 pounds.

As these flies are not intended to be used for casting it is probable no salmon ever saw one before. The fish were probably attracted by the air bubbles contained in the large floating bunch of bucktail as it skipped about on the surface. It was perhaps its strange appearance that appealed to them, yet I feel certain we do not begin to know all there is

to learn about fly fishing and the lures that might attract fish.

Here were two big salmon that spurned the renowned Jock Scots and Dusty Millers, yet took with glee the absurd, round bunches of brightly colored bucktail cast downstream and floating on the surface. By the time they arrive upstream, although perhaps maiden fish, they no doubt have all had some experience with salmon flies, and a fly made to look quite different from those they have toyed with probably causes surprise and interest.

SALMON POOLS



SALMON POOLS

WHY do salmon frequent some pools and shun others which seem just as well adapted to be tarrying or dwelling places? You often see a long stretch of most inviting water which never by any chance holds a salmon.

That there is a limit to the strength of current that salmon prefer is proved by the fact that many so-called choice pools are quite unfishable during high water, while other pools that are protected by rocky points or ledges harbor fish at all times. If the river falls a foot or two, the unfishable pools may then be found full of fish.

The pools which they prefer usually contain ledges, rocks, or stones under the lee of which they may lie with the least possible exertion or movement of the fins. Such spots usually hold fish. Should any of these fish be caught or move from these chosen spots,

that which flows along the bottom of the river. This is caused by cold brook water which is being continually added to the stream and runs on the surface. It may be that the salmon rise and jump for the cooling effect they thus obtain.

The Cascapedia Club waters have over 50 good pools. There are pools for high water, many for normal water, and pools that always contain fish even if the river is extremely low. There are rough water pools, and others that have a glassy surface and that are only adapted to dry-flies. Some contain no fish when the stream is high and more are not frequented when the river falls.

The four chief pools that always seem to hold fish and afford great sport are: Big Camp, Limestone, Captain, and Ledge. No matter what the condition of the water may be they always yield fish. The salmon may not always be found in the usual spots, but if you hunt for them they will be found. Fish often change their resting places according to the flow of water.

Big Camp pool is three quarters of a mile below Middle Camp. It is a long pool of about twelve drops and affords great sport. It is an easy pool to fish, for there are no obstructions to aid the salmon in their efforts to escape. It usually holds heavy fish. Sixty-eight salmon were taken there in 1924.

Limestone is three miles above New Derreen, the main camp. A bold rocky point extends out into the pool which turns the force of the current to the eastward. The fish usually lie just above this rock and down the centre of the pool below as well. There is no shade, it lies out in the full sun and is therefore supposed to be best after sundown, but it has always afforded me great sport in bright sunshine. This pool gave up fifty-two large salmon in 1924.

Captain, one and a half miles above Middle Camp, is a long pool with a high bank along the western side of the river and thick woods along the opposite shore. It usually holds many fish. It is fished on the eastern side of the river during high water and along

the western bank when the stream falls. This pool has ten or more good drops and yielded forty-two salmon in 1924.

The Ledge is a short distance above New Derreen. A ledge of rocks juts out into the river and parallels the right bank. It modifies the flow of water along its full length in high water and roughens the flow when the river is low. Fish lie all along the ledge. I have taken fish there when the river was in flood, and also with the smallest flies when the water was dead low. Forty-seven fish were taken there in 1925.

Although these pools are famous and afford great angling, there are three others which appeal to me, namely Patterson, 4-24, and Jack the Sailor.

Patterson is a large rock in mid-stream over and around which the water simply boils in flood time, and the current is then so strong that no fish can lie there, but during normal water, when the rock barely shows, a back-water is formed on the up-stream side of the rock by the dividing current and you usually

may find a fish or two. There is hardly room for more than two, but if the angler succeeds in landing them there are sure to be others in their place on the following morning. When you hook a fish at Patterson its first move is up-stream, but the force of the water carries it promptly into the rapids below where the canoe and you must follow.

4-24 is the Middle Camp house pool and the most beautiful spot on the river. This pool was named by an angler long ago who one day took four salmon there, each of which weighed exactly 24 pounds. It is a normal water pool quite bare of salmon in flood time. I fancy it greatly because it is one of the few pools where it is possible to beach your fish and also because I always have good luck there. In a few seasons it has yielded me 55 salmon that averaged 23 pounds. They ran in weight from 10 to 43 pounds and 13 were over 30 pounds each. The fish fight better there than in most places, probably owing to the greater width of deep water.



POOL 4-24

Jack the Sailor was named after a sailor lad who was the only survivor of a scow-load of lumbermen who were once wrecked there on a downstream journey. The water in Eastern Canada is so very cold that few of the inhabitants learn to swim.

Of this wonderful pool Lord Lansdowne wrote:

“ ‘ Jack the Sailor,’ was, I think, upon the whole, my favourite pool. It was not too far from home; it always held fish, generally large fish; and it was extremely dangerous, which perhaps added to its attractions. At this point the river flows between low cliffs surmounted by a thick growth of trees. Ribs of jagged rock run out into its depths, and could be plainly seen at low water, twenty or thirty feet below the surface. Here and there great water-logged snags had become firmly lodged among them. The whole arrangement was a standing invitation to a hooked fish to cut himself free. The wonder was, not that one lost fish, but that fish were ever landed amid such a maze of entanglements. One fish

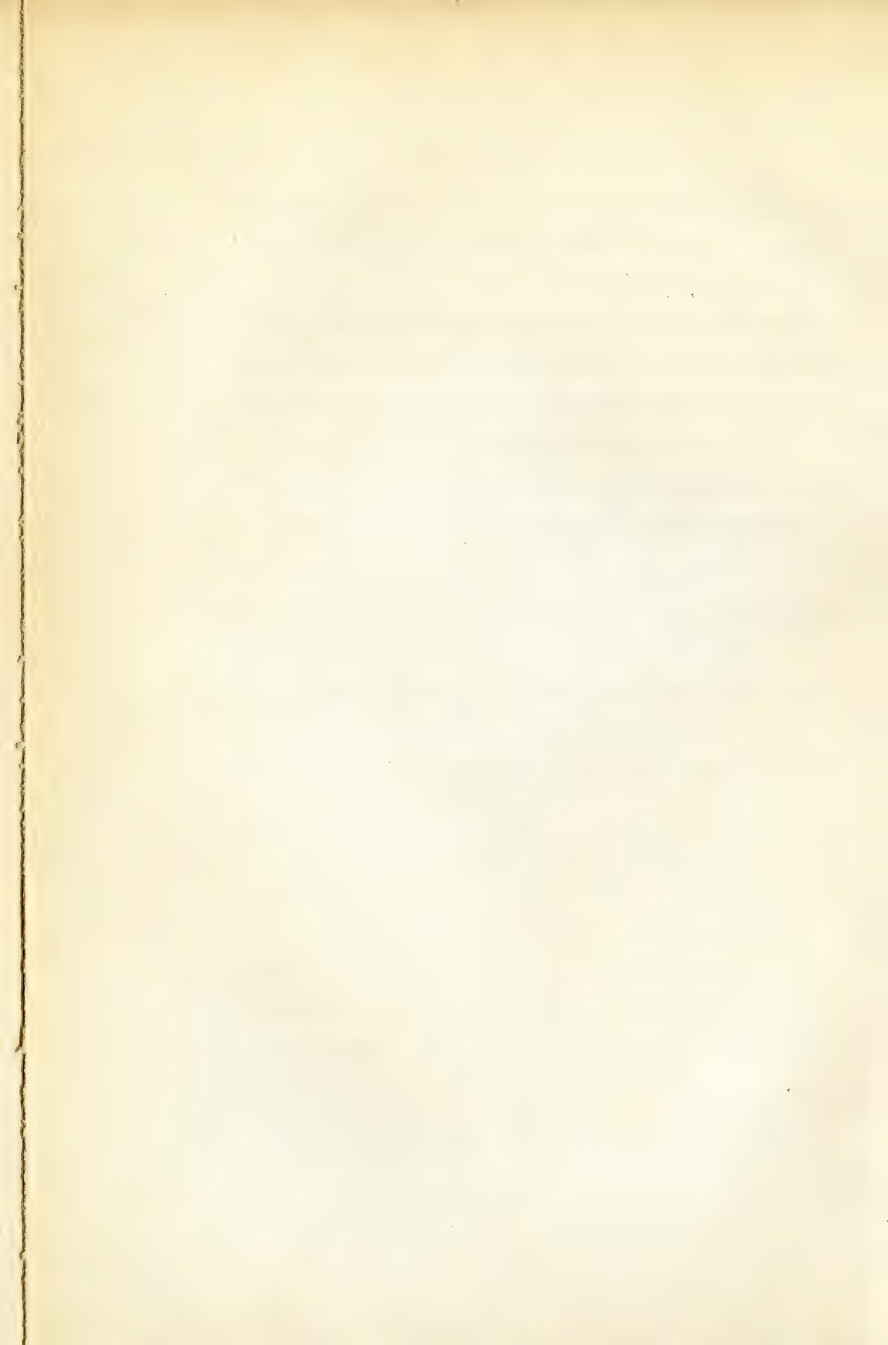
out of 'Jack the Sailor' was to my mind worth three caught in any other pool. I used often, when going down the river late in the evening, to stop for a couple of casts in 'Jack,' although I knew that another canoe must have been there not long before, and I more than once succeeded in stealing a fish out of it just as it was becoming dark.

"Bitter experience had taught me that there was one way, and one way only, to avoid disaster. If you allowed your fish to explore the fastnesses of 'Jack the Sailor' you would most certainly lose him, and probably your tackle also. The only chance was to prevent such exploration at any cost, to get him tight by the head, and to hang hard on to him, even at the risk of a break."

I agree with everything that Lord Lansdowne says. "Jack the Sailor" is most awe-inspiring and fascinating. I never pass it by on my canoe journeys up and down stream but with great regret if it is not possible to wet my line. The fish that tarry there are of the large, hard-fighting variety, for it is no

place for pigmy fish, or for pigmy anglers either. In 1925 an angler captured a 46 pounder in this pool.

On the upper stretch of river called Lazy-bogan there are several celebrated pools, but there we limit ourselves to 12 salmon per rod so as not to disturb the fish on the chief spawning grounds. The two most famous of these pools are Parsons and The Forks.



THE KELT

THE KELT

AFTER spawning in the rivers of Eastern Canada the salmon become emaciated, dull in color, and unpleasant looking objects. Many of the fish die, especially the large males, and those that survive drift slowly down to the sea tail first and there recuperate, regain their brilliant silver livery, and increase in size.

It is in some rivers only that many fish remain in fresh water until the following spring or early summer before returning to the sea. These mended fish have as a rule regained a bright coat and a healthy appearance, but they look elongated and are light in weight when compared with fresh run salmon.

Why mended kelt are to be found in some rivers and not in others is not known.

The Ristigouche seldom holds many kelt. Being a large river with a fine flow of water

and few shallow places, it is probable that the kelt can escape to the sea before the river freezes, or possibly even later under the newly formed ice.

The Grand Cascapedia is a more narrow and a more quickly flowing stream, has many rapids and, when the water falls, many shallow places between the pools. It is probable that the salmon which spawn late are frozen in and must pass the winter in deep pools or stretches of deep water, for they cannot escape to the sea.

Here in the spring and early summer the mended kelt are very numerous, but as a rule they all disappear about the 25th of June. These fish are very hungry and keen to take the angler's fly. From my observation they appear to be mostly hen fish and, although a hooked kelt is said always to go down-stream towards the sea, these fish often fight upstream and jump repeatedly. Many have been tagged but no marked fish has ever been recaptured.

A mended kelt can be recognized at times

with great difficulty, but although bright to look at it is the brightness of tin and not of silver and they are far below the normal weight of a healthy salmon. A kelt 45 inches long may weigh but 10 or 12 pounds. This does not prevent them from being at times very lively fish to take, for they have no superfluous flesh to carry and their fins are strong and tough. This enables them to handle themselves quickly and swim with great speed.

I have hooked, netted, and returned with care 22 large mended kelt in a day's fishing, and over 60 in a season.

Many anglers believe these fish are kelt which returned to the sea after spawning, have become mended in salt water, and have followed the shoals of salmon to the coast and ascended the river in their company. This belief comes from the fact that both fish are often taken from the same pool.

This belief can hardly be true for I have found many mended kelt in the Grand Cascapedia early in the season before the salmon

had arrived; they also disappear from the upper pools first and gradually assemble in the estuary in numbers as the fresh salmon are running in.

There are hundreds of mended kelt in Cain's river, New Brunswick, in May, that are moving down to the sea. As the run of salmon does not appear in this stream until September, there cannot possibly be any question that they journeyed or arrived in company.

SALMON SCALES



SALMON SCALES

WHAT knowledge there was concerning the life of the Salmon (*Salmo salar*) was mere surmise prior to Mr. H. W. Johnston's discovery, in 1904, that a fish's life history could be read by deciphering the rings on its scales. Since then, thanks to Messrs. Malloch, Calderwood, Hutton, and Menzies in Great Britain, and to our Professor Gilbert and others, scale reading has become a science and much information on the subject has been obtained.

When a fish of a few inches in length is covered with scales it follows that, as the fish increases in bulk, the scales must increase in size, for they do not increase in number.

The growth of the samlet's scales in fresh water is slow and the rings that form are close together. The centre, or core of a salmon scale, denotes the life of a parr until it becomes a smolt. By counting these fine

lines one may tell whether the small fish was two, three, or four years old when it descended to the sea as a smolt.

The ridges or rings grow closer together during the winter months when the water is cold and food is scarce, but they are wider apart and more pronounced in summer, for the forage is then good and the fish increase more rapidly both in length and in bulk.

After the smolt has gone down to the sea it develops gradually into a grilse, or adolescent fish, which may return to the river the following year, but this does not happen in all rivers. I have never seen any grilse in the Grand Cascapedia. Some rivers do have an abundance of grilse.

It is sometimes difficult to distinguish a grilse from a small salmon without examining its scales. Its outward signs are a pronounced forked tail and scales that shed more easily than do those of an adult salmon. Their fins are also somewhat larger for their size, which I believe is the reason why they are more active than a salmon of the same weight.

Salmon increase very rapidly in size when in the sea and their scales develop accordingly. Well-defined rings are added from May to November, and rings much closer together are formed from November to May when the food is poor.

The age of a "maiden salmon" is known by counting these seasonal lines and adding them to the smolt age as designated by the scale centre.

A maiden fish is recognized by its great beauty, silver brightness, and the fact that it seldom has any black spots below the lateral line. If you examine a salmon's gills you will find that in fresh-run maiden fish they are blood-red in color, quite clean and sound, and not afflicted with gill-maggots. They are to my mind far superior as food to fish that are running in for the second or third time and that have dark purple-red and tattered gills with occasional maggots. The flesh of these latter fish is pale in color, lacking in fat and also lacking in flavor.

I examine every salmon I take with care,

and never send any to my friends that are not quite clean in the gills.

After the smolt migrate to the sea the fish may remain in salt water from one to five consecutive years before returning to the river as "maiden fish."

It used to be thought that all salmon that survived in the sea returned twice or more often to spawn, but it was discovered that but a small percentage of the Atlantic salmon spawned more than once, and that this percentage differed in the fish of different rivers.

The fish that return to the rivers of the east coast of Scotland to spawn a second time average about 4%, while of the scales collected from the little river Add on the west coast, 50% showed that they had already spawned. Of 250 sets of scales from the Moisie in Canada 95% were ascending the river for the first time.

When a salmon leaves the deep water and begins its journey to its natal river it com-

mences a protracted fast and loses probably 20% of its weight by the time it reaches the kelt stage, that is, after spawning. An absorption or erosion of the scales takes place which is most pronounced in the cockfish, and in extreme cases all age evidence is removed from the scales. Many of the fish, the large males more especially, perish after spawning, but those that survive descend to the sea carried slowly by the current, headed up stream. In some rivers numbers remain all winter and go to sea in the spring as bright "mended kelts."

When the kelt reaches the sea it begins to feed and increase in bulk, so that new material must be added to the scales to replace that which was lost in fresh water. As soon as the frayed scales become rounded off, the summer and winter rings appear again, but where the new growth joins the old a decided scar is left which is called a "spawning mark."

The number of "spawning marks" on a

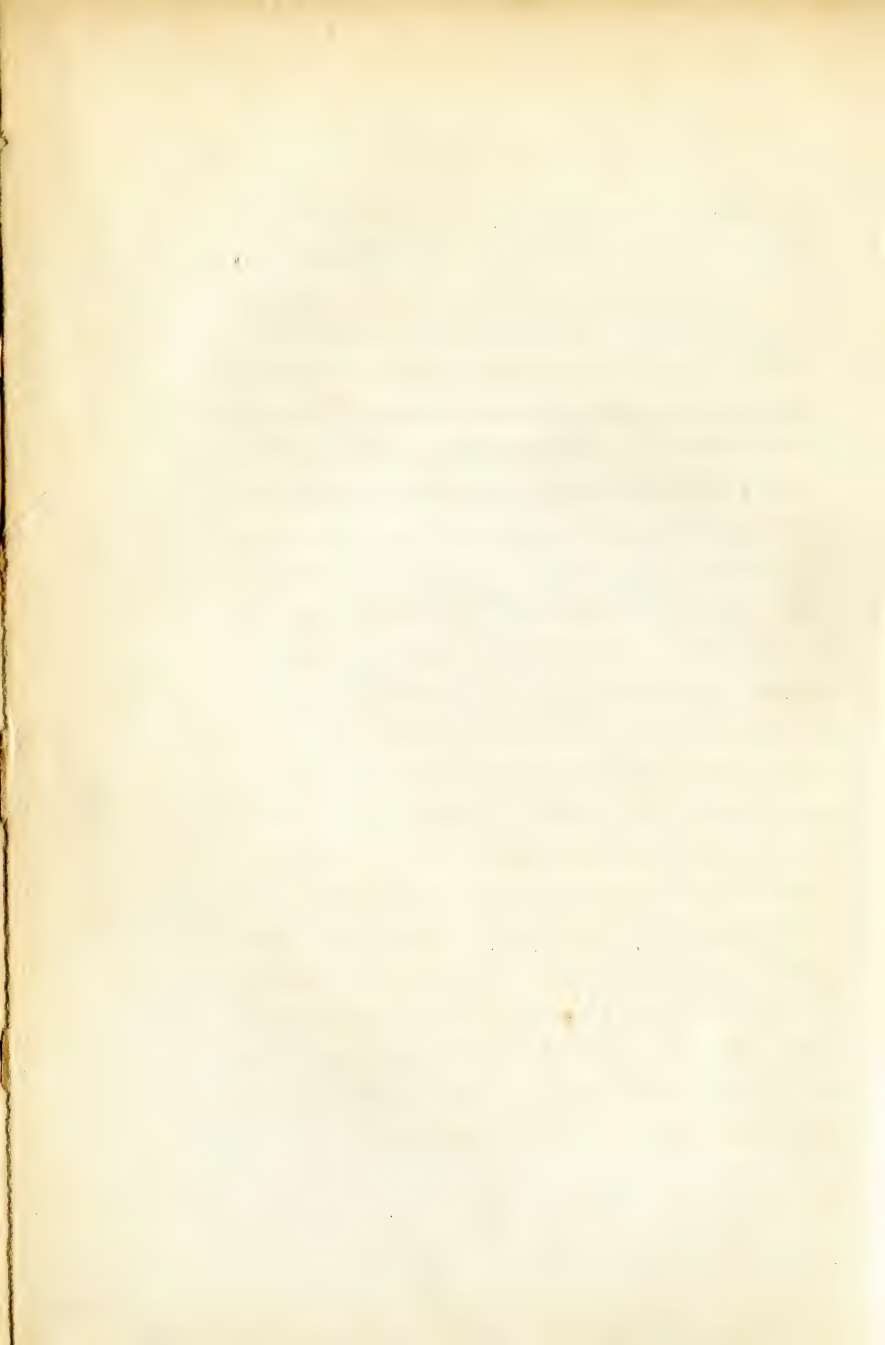
scale determines the number of times a salmon has entered a river for the purpose of spawning.

The record scale is from the Moisie River in Canada, a fish that had returned for the fifth time to spawn with an estimated age of fourteen years and a fraction.

**SALMON (*Salmo salar*) OF THE
RIVER MOISIE (Eastern Canada)**

BY

W. J. M. MENZIES



SALMON OF THE RIVER MOISIE

INCLUDED in the area of distribution of *Salmo salar* are the western coasts of Europe as far south as the Franco-Spanish border as well as the British Isles and Iceland, and, in addition, the eastern coast of Canada and the United States down to the State of Maine. A very large number of investigations have been made in Great Britain and various European countries, both by marking the fish in order to trace their subsequent growth and movements, and by reading their age and history from the scales. Length calculations from scale measurements have also been made in Scotland, Norway, and Sweden.

Certain marking experiments have been made with *Salmo salar* as a subject both in Canada and the United States, but, so far as I am aware, no effort has been made to deal with their scales, or if so, no results of such investigations have been published.

I therefore approached with some care a small collection of scales of salmon from the river Moisie which flows into the north side of the Gulf of St. Lawrence. Unfortunately the collection could not by any means be called representative, since the sample I have to deal with consists of particulars of only 120 fish caught in 1922 and 257 taken in 1923, while other details of the catch which were supplied to me showed that some seven or eight thousand fish may be caught by nets and rods in the course of a short season of about two months.

The period of collection also of these small samples did not extend throughout the season, but was confined to about a month. One was therefore at a grave disadvantage in the examination of scales, not only from a strange river but also from another country. As a preliminary measure it was only possible to use accustomed methods, but after trial the formation of the ridges and zones of growth were seen to resemble exactly that of the scales of salmon of this country, and

no special difficulties arose in reading the apparent age.

In such rivers as the Moisie, subject to extreme climatic conditions and liable to prolonged and severe cold during the winter months, one does not know in what manner kelts may behave after spawning. I approached the subject of the spawning mark on the scales with the possibility in my mind of a rapid migration from the river by the kelts immediately after the completion of the redds. I was prepared to find a somewhat less definite scar than is usual on the scales of previously spawned fish caught in this country. Fortunately, among the collection sent were the scales of three kelts and a "baggot" (*i.e.* an unspawned female), all caught in late spring or early summer, and these seemed to suggest that some kelts at least spend the winter in the river.

Acting on the assumption that a spawning mark is shown by all fish which have spawned and have again returned to the river as clean fish, I find that of the total of 377 salmon, 63,

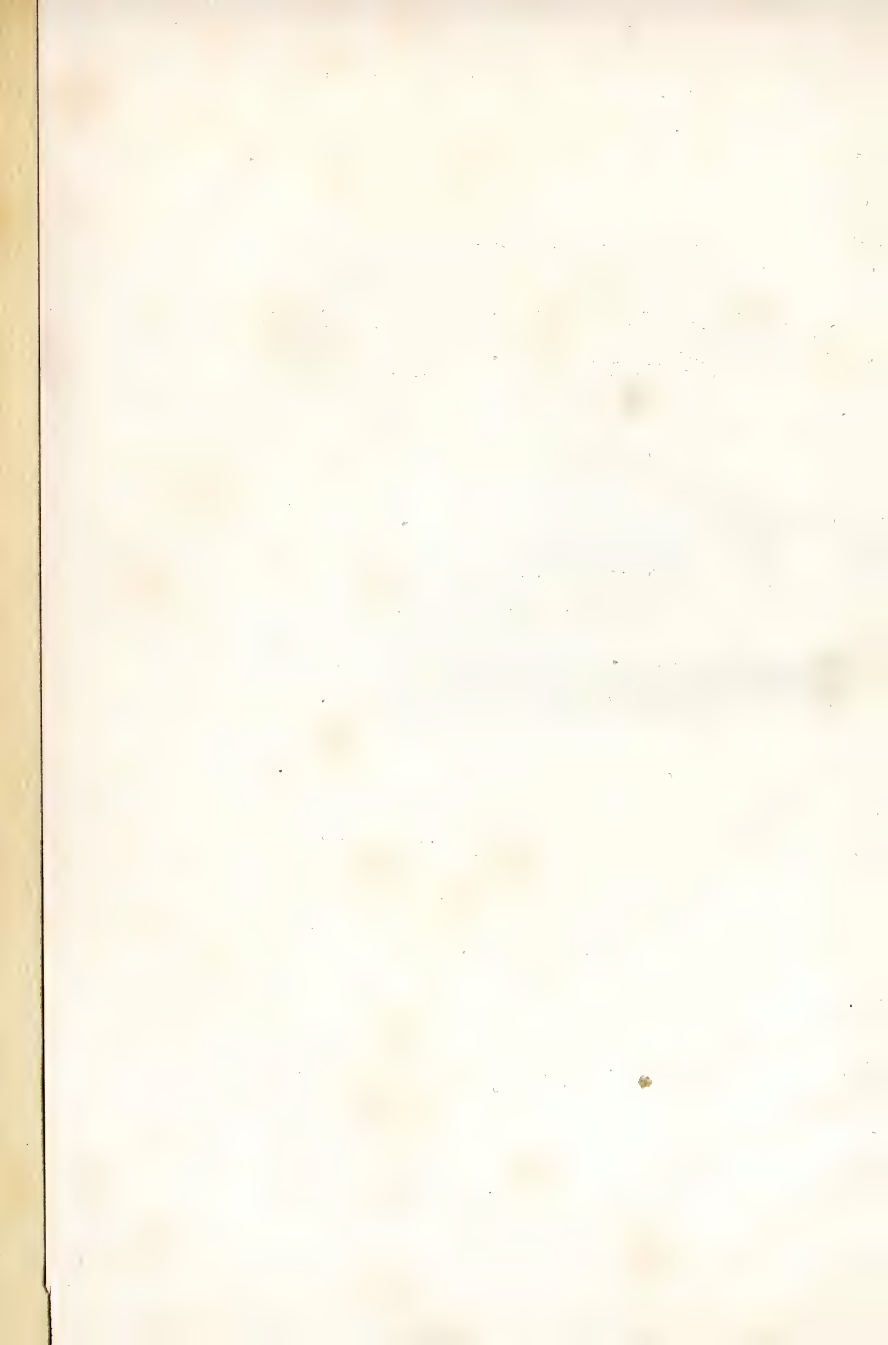
or 16.7 per cent., fall into this category. This proportion is very much higher than we are accustomed to find in the rivers of the east coast of Scotland, where it is very unusual for more than 5 per cent. of the stock to be on other than their first return to fresh water.

Of these 63 Moisie salmon, 35, or 9.3 per cent. of the total sample, had spawned once; 11, or 2.9 per cent., had spawned twice; 16, or 4.2 per cent., had spawned three times; 1, or .3 per cent., had spawned four times.

The numbers of salmon which survive to return to the Moisie for a third and fourth time are noteworthy, and more especially is this so in the case of the single fish which had spawned four times, and was on its fifth journey to the river when netted and killed. Of all the scales examined in Scotland, we have records of only three fish which had helped so materially in the reproduction of their species. Two were clean fish, one of 19 lb. from the Conon, and another of $29\frac{1}{2}$ lb. from Loch Maree; the third was a kelt of 12 lb.



RECORD MOISIE SALMON
On fifth journey to spawn
14 years old



caught in the Add in Argyllshire, which, since it was again in the kelt stage, had spawned on five occasions. The Moisie fish weighed $38\frac{1}{2}$ lb., and, like the Scottish fish was a female. Its scales show two years of river life, followed by apparently three years in the sea and then a full year's feeding between each spawning period — that is, it adopted the long-absence habit and spawned biennially, descending as a kelt in the spring of one year, and remaining in the sea until the spring or early summer the following year. Its total age was consequently thirteen years.

As absorption of scale material during the freshwater fast may remove evidence of a complete winter's growth, the age of any of these spawned fish at the time of their first ascent of the river cannot be estimated with absolute certainty, but, as far as can be judged, 58 of the 63 fish spawned for the first time after spending three winters continuously in the sea.

The average age at migration of the Moisie smolts is slightly higher than is usual in the rivers of the north-east of Scotland, but is lower than is found in Norway. In Scotland the majority of smolts are two years of age, but in certain districts as many as 25 per cent. of the total may be three years old. In Norway, the proportion of three-year-old smolts may be as high as 75 per cent. In the Moisie, the percentages of two- and three-year-old migrants were 56 and 39 respectively; the remainder, consisting of those four years old, formed 5 per cent. of the whole, while one fish had spent five years as a parr in the river.

SUMMARY

The analysis is based on a rather small collection of scales and measurements which may possibly be not quite representative of the salmon (*Salmo salar*) of the river Moisie (East Canada).

The portions of the scales representing both river- and sea-life are easily read, and

closely resemble the scales of European salmon in formation and growth, but it is not possible to decide, from the material available, if the periods of slow and rapid growth correspond with the winter and summer seasons respectively.

The majority of Moisie salmon return to the river after spending three winters in the sea; some may do so after an absence of 2+ winters, but those which spend 2, 3+, and four winters away from the river are rare, and apparently grilse (1+ winters group) are entirely absent.

Erosion of the scales during the period of abstinence prior to spawning takes place normally, and a spawning mark is subsequently formed on the scales in the usual manner. The number of fish on their second or subsequent return to the river (16.7 per cent.) is high, and the number which have spawned more than once (11 twice, 16 three times, 1 four times) is relatively considerable.

The average age of the Moisie smolts is

intermediate between that of the smolts of N.E. Scotland and of Norway; 56 per cent. were two years, and 39 per cent. three years, old when they first entered salt water. The balance were four years of age, with the exception of one, which had spent five years in the river.

The average sizes of the 2+ winters group, 9.15 lb. and 29.4 inches, are considerably less than the averages of fish of the same history in Scotland, but the result may be affected by the period of the season at which the samples were taken. In the older group of 3-winters fish the averages, 20.7 lb. 37.3 inches, correspond closely with the Scottish figures. These latter fish are fat and well nourished, as their coefficient of condition, 1.23, shows; they compare favorably with the most finely shaped Scottish fish. The younger group, however, besides having a small average size, have for their length a rather low coefficient of condition — 1.

The sex of each fish was given with the other details, but presumably was judged

from external examination only. The proportion of males seems unduly high, and the erosion of the scales also in many cases does not suggest that the sex has been accurately determined.

**SALMON OF THE GRAND
CASCAPEDIA RIVER**

BY

W. L. CALDERWOOD, F. R. G. S.

SALMON OF THE GRAND CASCAPEDIA RIVER

82 Newbattle Terrace
Edinburgh, 19th December 1926

DEAR MR. GRAY GRISWOLD:

I received the completed record of the Grand Cascapedia scales yesterday, and am now able to give you an account of them.

The leading group is the 3 winters in the sea. There are 94 of them, or 56.3% of the total. The only other group of any size is the 1 spawning mark lot. There were 47 of them, and of that number 33 were 3 winter smolts.

With regard to the 3 winters in the sea group, it has also to be said that a most noticeable feature is the age before the first descent to the sea. 52 of the 94 were 3 year old smolts, and more remarkable still, 32 were 4 year old smolts. There is no 1 year smolt. We have never struck such a high per-

centage in smolt age in any of our British scales. Here is the tale of the 167 samples in brief:

Percentage of Smolt Ages

<i>Age Groups</i>	<i>Years in River</i>			
	2	3	4	5
2 + winters	9.1	54.5	36.4	—
3 winters	8.5	55.3	34.1	2.1
3 + winters	—	100.	—	—
4 winters	—	100.	—	—
Spawned	1.6	66.6	31.8	—
Total	6	59.9	32.9	1.2 100

The feeding for smolts in the river must be rather exceptionally poor. If the majority of the fish spawn high up it is a hard country for their offspring. In Norway there are 5 year old smolts in the Finmarken province, which is within the Arctic circle.

With regard to fish which have previously spawned, none had spawned more than twice before the third ascent on which they were killed, *i.e.* they were potential 3 S M fish. There were 13 of these, and for fish which

have been out of the sea reproducing their species, the weights are wonderfully good. They range from 29 to 41 lbs; and the average is $33\frac{1}{2}$. Both the 29 and the 41 were 4 year smolts; 7 were 3 year smolts.

Now with regard to your heavy fish, only one is above 41, viz., a $42\frac{1}{2}$ lb. fish. It had been a 3 year smolt and had spent 4 continuous years in the sea. After that fish the heaviest lot are contained in the 2 S M group and are the 3 year smolt fish of that group. The weights are: 33, 39, 31, 31, 32, 32, 32. Five of the 7 were females, and one was a doubtful male.

A small fish of $6\frac{1}{2}$ lbs. was marked as a grilse, but the scale reading showed it to be a small summer salmon, a 3 year smolt that had been 2 years and a bit in the sea.

One scale was regarded as that of a kelt, weight not given, length 41 ins., female.

The weights of your most numerous group, the fish which have spent 3 consecutive years in the sea, vary a great deal — from 13 lbs. to 32 lbs.

Of this crowd, those that were 3 year smolts average 23.1, which is just your river average, I think; those that were 4 year smolts average 24.3.

With regard to the youngest group — the 2 + winters — the average weight is 11.7, the average length 30.6 (2 of this group weighed 14 lbs. but a 6 and an 8 brings down the average).

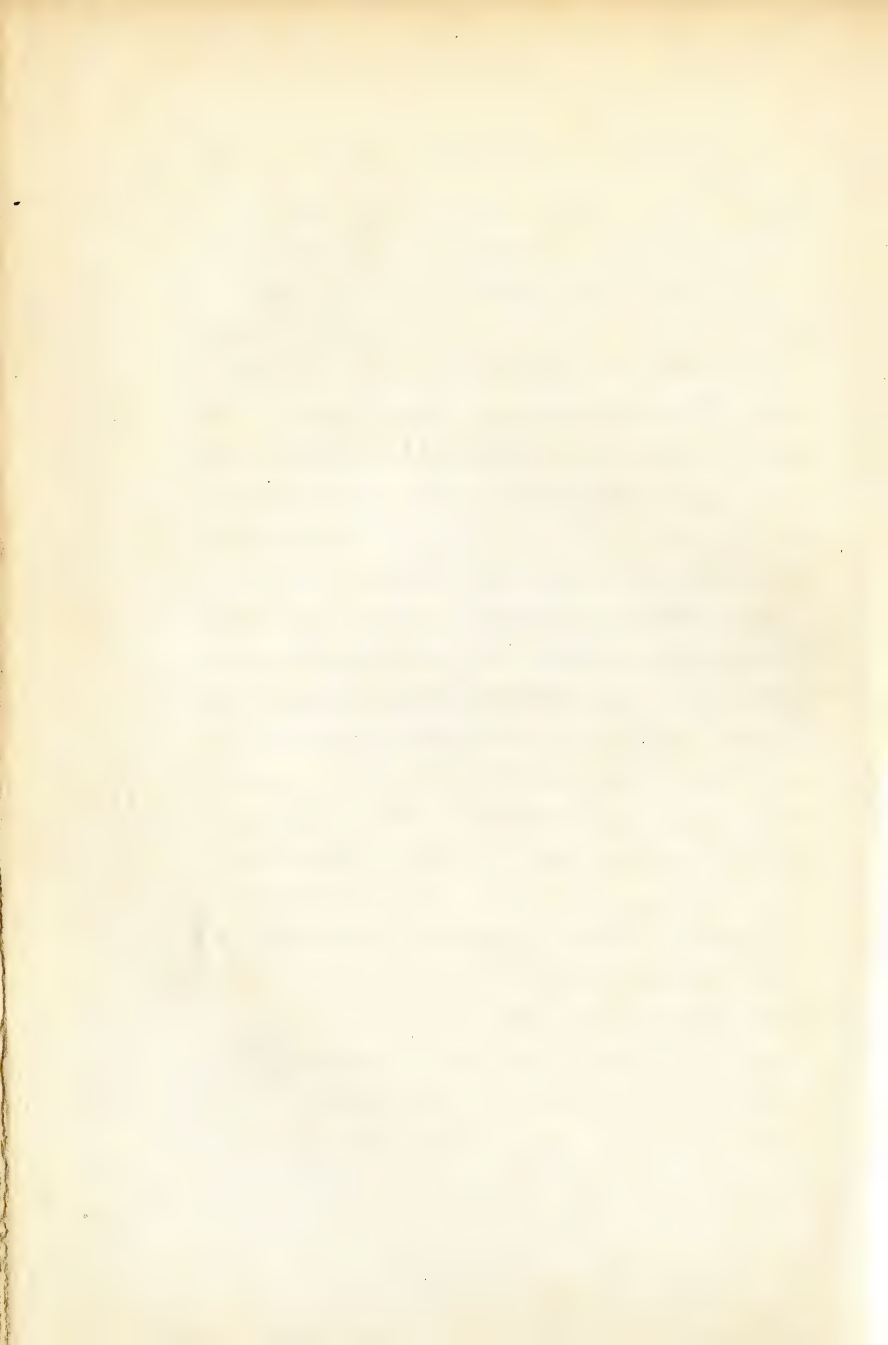
That, I think, pretty well completes a résumé of the data collected except for calculated lengths at each year, and the condition factor, I need not perhaps trouble you with these, but with your permission I should like to put a note about the data in the Royal Society Edinburgh Proceedings here, and if this is done I will of course send you the paper.

With all good wishes for the festive season,

Yours sincerely,

W. L. CALDERWOOD

THE PACIFIC SALMON



THE PACIFIC SALMON

IT had been believed that all the salmon that were hatched in the rivers of the Pacific Coast went down to the sea before their scales were formed, and that they all returned when they were four years old to spawn.

When Professor Charles H. Gilbert made his scientific study of the scales of these fish he discovered much that was interesting.

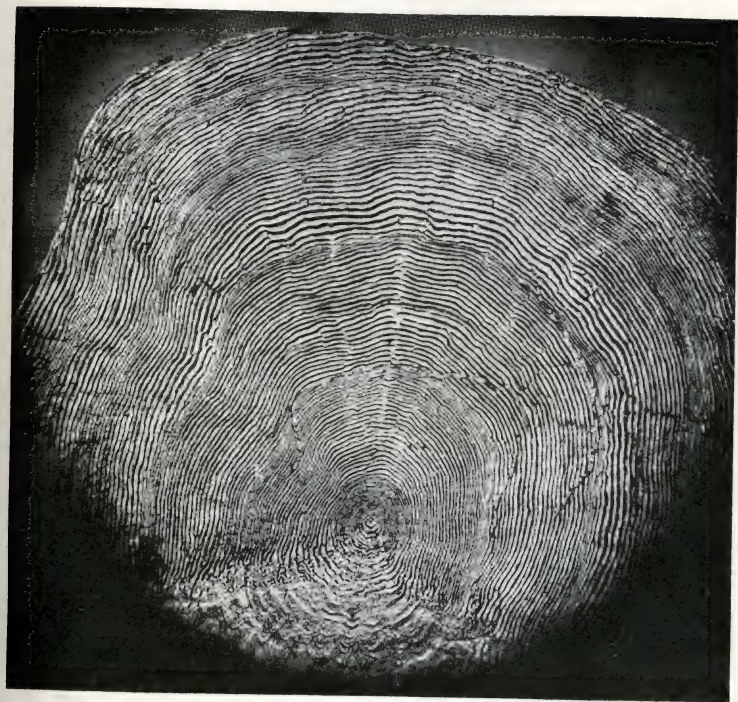
Although these scales are formed in the same manner as those of the Atlantic salmon, their appearance differs. They lack the strongly marked smolt centre and have no spawning marks. This is quite natural, for the fish do not remain several years in fresh water before going to sea and they only spawn once and all die after spawning.

This is of peculiar interest as concerns this species, for as they all die at maturity the question of their age is of great importance.

“The scales of the Pacific salmon persist throughout life and grow in porportion with the rest of the fish, principally by additions around their borders. At intervals there is produced, at the growing edge, a delicate ridge upon the surface of the scale, the successive ridges then formed being concentric and subcircular in contour, each representing the outline of the scale at a certain period in its development. Many of these ridges are formed in the course of a year's growth. Spring and summer being a period of rapid growth, the ridges are widely separated, while the winter ridges are close together. These two areas constitute a year's growth.”

In the early spring two sizes of young sockeye or red salmon have been observed on their downward migration to the sea. The larger are yearlings, which instead of going to sea the previous spring as fry, have remained in the lake during their first year. The smaller are the fry just hatched.

This happens also with the tyee or chinook and also with the coho salmon. The hump-



PACIFIC TYEE SALMON
Sixth Year



back and dog-salmon always migrate to the sea while in the fingerling stage.

All species of Pacific salmon cease to feed on entering fresh water on maturity.

It has been found that while the majority of the Fraser River run are in their fourth year when they return to the river, a considerable number of them, including all the larger individuals, are in their fifth year. The smaller fish which return are three year old grilse.

The largest variety, the chinook, tye, or king salmon, run to a great size, it is claimed to 100 pounds. I have seen a tye that weighed 72 pounds, and have taken them over 60 pounds in weight. The fishermen always insisted that these fish were only four years old, which I could not quite believe. From the investigation of the scales it has been ascertained that there are male fish of this species six and even seven years old that return to spawn. The females are mostly in their fourth year, and the small, so-called spring fish or sachems, which accompany the

run, are grilse, precociously matured males that are two or three years old.

Professor Gilbert's summary on the subject is:

1. The sockeye spawns normally either in its fourth or fifth year, the king salmon in its fourth, fifth, sixth, or seventh year, the females of both species being preponderatingly four year fish.

2. The young of both sockeye and king salmon may migrate seaward shortly after hatching, or may reside in fresh water until their second spring. Those of the first type grow more rapidly than the second, but are subject to greater dangers and develop proportionately fewer adults.

3. Coho salmon spawn normally only in their third year, but adults are developed almost exclusively from those which migrate as yearlings.

4. Dog salmon mature normally either in their third, fourth or fifth years, the humpback always in their second year. The young of both species pass to the sea as soon as they are free swimming.

5. The term "grilse," as used for Pacific salmon, signifies conspicuously undersized fish which sparingly accompany the spawning run. They are precociously developed in advance of the normal spawning period of the species. So far as known the grilse of the king salmon, coho, and dog salmon are exclusively males, of the sockeye almost exclusively males, except on the Columbia River, where both sexes are about equally represented. The larger grilse meet or overlap in size the smaller of those individuals which mature one year later at the normal period.

6. Grilse of the sockeye are in their third year, of the coho and dog salmon in their second year.

7. The great difference in size among individuals of a species observed in the spawning run are closely correlated with age, the younger fish averaging constantly smaller than those one year older, though the curves of the two may overlap.

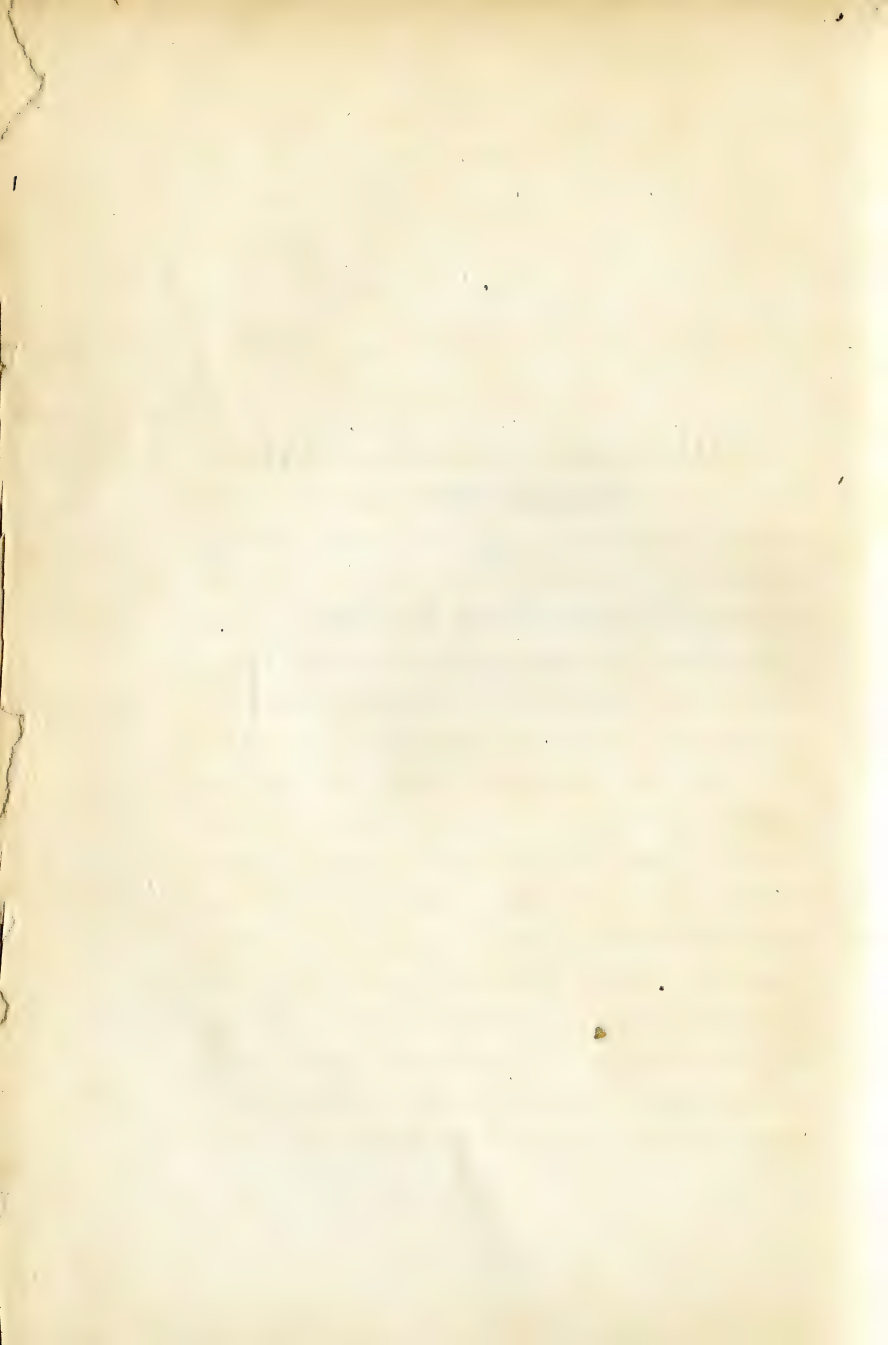


**NOTES ON NEW ZEALAND
SALMONIDAE**

BY

MALCOLM ROSS, F.R.G.S.

“ The Field ”



NOTES ON NEW ZEALAND SALMONIDAE

FOR nearly half a century now New Zealand has been wrestling with the problem of the acclimatisation of the Atlantic variety of salmon, and for most of the time the problem seemed incapable of solution. Trout of the brown and the rainbow varieties were introduced, and, as almost every angler knows, they grew and multiplied beyond all expectation. In the splendid rivers and glorious streams in which the country abounds they found a habitat to their liking, and a great variety of food. Wherever they were put they flourished. The country became an anglers' paradise, though, like the Garden of Eden, it had its serpent, in the shape of the eel, which in many of the streams took toll of many trout. Cormorants also added a new and welcome food to their menu. But these

were minor difficulties in the path of acclimatisation, and the trout flourished and became thoroughly well established. Brown trout grew to great size, and it was not uncommon to catch fish weighing up to 20 lb. and 25 lb. in weight. The rainbows, imported at a later period, also did well, and grew to a similar size. They did not thrive in ordinary rivers having outlets to the sea, but in rivers flowing into and out of the lakes, especially those in the North Island, they have become well established. After some years they began to deteriorate in size and quality, but apparently the trouble was simply a question of food supply. The Government thereupon undertook the netting of the lakes, and, great hauls of fish being captured and killed, the food supply soon began to increase, besides which there were fewer fish to be fed.

The result was just what might have been expected. If you put a thousand sheep in a field that has only grass for a hundred you will very soon have a poor flock of sheep. If you kill off nine hundred you will soon find

great improvement in regard to the remaining hundred. This is exactly what happened in regard to the rainbow trout in the Rotorua and Taupo lakes. These, with some other North Island lakes and streams connected with them, provided the finest rainbow fishing in the world. But with the great increase in numbers the fish began to diminish year by year in size, and even to show signs of disease. The netting soon made a change for the better, till more lately the fishing has been practically back to its old standard. During two recent seasons, while the fish were running into the famous Tongariro River which flows into Lake Taupo, in the centre of the North Island, I and those with me enjoyed sport that was almost equal to salmon fishing, fish up to 15 lb. in weight being caught. A day's catch often averaged $8\frac{1}{2}$ lb., and one morning my companion came home with four fine fish the average weight of which was 11 lb.

In such circumstances it seemed very strange that, though many attempts were

made, we could not succeed in the introduction of *Salmo salar*. The eggs were brought here, young fish were hatched from them and liberated, but year in and year out there was never a sign of genuine salmon. Acclimatisation societies began to despair of ever achieving success. Finally, a few years before the Great War started, the Government took the problem in hand in a determined way. Between 1907 and 1911 2,250,000 ova were imported by our Marine Department and hatched out at Lake Te Anau in the South Island. The effort was somewhat relaxed during the War years, and the success of the experiment remained doubtful. Then it began to be rumoured abroad that at rare intervals fish resembling Atlantic salmon had been caught in the Waiau River which carries to the sea the overflow from Lakes Te Anau and Manapouri. Not until 1923, however, was it definitely established that the acclimatisation of *Salmo salar* had been a success.

In that season some few fishermen trying their luck in the Upukororo and the Eglin-

ton, rivers flowing into Te Anau, caught 98 salmon of the Atlantic variety. One angler accounted for 42 of these fish. The heaviest weighed 14 lb. and the average weight was 8 lb. They were all caught on the spoon and the minnow, the fishermen apparently not having been accustomed to use the fly in angling for big fish. Towards the end of the season salmon were reported to be plentiful in the Eglinton. Lake Te Anau is connected with Manapouri by a short river, and out of the latter lake flows a swift big river, the Waiau, till it reaches the sea some fifty miles from the lakes. In this river near its mouth some salmon fresh from the sea were also caught, and, since, there have been many thousands of parr in the lake.

Thus, after years of patient endeavour, the fact has been established that *Salmo salar* is acclimatised in New Zealand waters, and though at present we have not sufficient data to enable us to make a definite statement as to the extent of the success achieved or achievable, all our experience in connection with

the acclimatisation of fresh-water fishes in this country leads us to hope for the best.

The fact that no very big fish have been caught, and that some of them were of poor quality — most probably kelts — led one critic to suggest that we have not got the best kind of salmon in New Zealand. This critic argued that there are sub-species of *Salmo salar*, and that we had not got the right species. He suggested that a spring run will breed spring-running fish; the summer run summer-running fish. He feared we had got just about the worst kind of salmon, and that from these we could not expect to breed the best kind of fish.

The statements made by this critic, who by the way frankly admitted that he had not himself caught Atlantic salmon, led to a lengthy but very interesting correspondence in the columns of the Christchurch press. Nearly all the correspondents have taken a different view from that which I have just stated. I have been at some trouble to ascertain the facts in regard to the progenitors of

these salmon, and at this point it will be advisable to put them on record. Of the 2,250,000 eggs imported 1,250,000 were stripped from the early spawning fish netted in English, Scottish, Irish and Eastern Canadian rivers, so that it can scarcely be said that we have not had ova from the right kind of stock. The balance of the ova was obtained in the second month of the spawning season in the Northern Hemisphere.

One very important fact I gathered from Mr. Ayson, the head of our fisheries department, and a man of much knowledge. He had sent his men to get ova from fish netted in the rivers running into Lake Te Anau. In all 650,000 eggs were obtained, and these eggs were similar in size and quality to the eggs obtained for New Zealand from Northern Hemisphere *Salmo salar*. Moreover the fry hatched out into fine, strong, vigorous young fish. There was no sign of degeneracy either in the eggs or in the fry. The whole of the fry hatched out were destined for the tributaries of a northern river, the famous Wan-

ganui, which has splendid pools and reaches. Its source is in the snow-clad volcanic mountains of the North Island, and it flows for many miles through wooded country.

Whatever may be said or thought about *Salmo salar* from the Atlantic there can be not the slightest doubt that the quinnat from the Pacific coast of North America are now thoroughly established in several New Zealand rivers in the South Island. Our quinnat have been reared in a tributary of the Waitaki, one of the big South Island rivers whose waters have their source in the eternal snows of the mighty Aorangi in the very heart of the Southern Alps. It has branches that feed three sub-alpine lakes — Tekapo, Pukaki, and Ohau. The first shipment of quinnat eggs for the Waitaki arrived in January, 1900, and these were from the first of the season's spawning — fish netted in October and November. The second shipment was mainly from fish that spawned two or three months later. Apparently the time at which these fish run does not make much difference

in regard to the time at which they spawn. An eminent authority, the late Professor Cloudesley Rutter, states that the spawning times of the different runs merge. The earlier salmon go farther up the river, and as the season advances the later runs stop at lower points in the river. Early and late-running salmon are found spawning at the same time in North America. It is interesting to note that exactly the same thing happens here at the other end of the earth. In the Waitaki the quinnat begin to run between Christmas and the New Year. Such fish go right up to the head waters of the Waitaki. Fish that run in March and April stop in reaches lower down, while those which run in May and June stop less than half way up the river and the very latest run does not go beyond ten miles from the sea. We have both the quinnat and the sockeye in these southern rivers, but the quinnat are in by far the greater numbers.

Here again we have an interesting parallel in regard to the manner in which fish run up the rivers for the spawning. In 1902 half-a-

million sockeye ova were imported, and of these 200,000 were liberated from a temporary hatchery at Lake Ohau. These fish remained in the lake, going up the streams running into it to spawn, and every fourth year it was noticed that there was an especially big run, just as was the case in the Fraser River. It is just possible also that some of the *Salmo salar* bred at Lake Te Anau have stayed in the lake and have to all intents and purposes become land-locked. There is at all events a theory that they have stayed in the lake because they have not yet found the outlet to the sea, or because they have found sufficient food in the lake itself, and after coming to maturity have gone up the rivers entering the lake to spawn. Personally I think the former supposition may be correct but not the latter, for, in a river with much food in it, parr will leave for the sea earlier than those in the rivers where there is not much food. Hutton, I note, says it is a question of nutrition, and he is probably right.

But I have wandered away from the quinnat. Anglers have been busy with them in and near the estuaries of the southern rivers in which they have been running in great numbers, and have had fine sport with the minnow and the spoon. A few fish have been caught on the fly, but success seems always more certain with a spinning bait. Possibly these fish have not been properly tried with fly yet. A few fish weighing 40 lb. have been caught with rod and line, but there is little or no doubt that still bigger fish have been running up the Canterbury Rivers. Fish ranging from 42 in. to 50 in. in length have been found stranded on the river beaches after spawning and these according to Cloudesley Rutter's tables should weigh when in good condition from 55 lb. to 60 lb. or more.

